CLEMENTINE-BASED GEOLOGY OF THE MOSCOVIENSE BASIN, LUNAR FARSIDE. *Robert A. Craddock[1], Mark. S. Robinson[2], B. Ray Hawke[3], and Alfred S. McEwen[4];* [1]Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution, Washington, DC 20560, craddock@ceps.nasm.edu; [2]Department of Geological Sciences, Northwestern University, Evanston, IL 60208; [3]Hawaii Institute of Geophysics and Planetology, SOEST, University of Hawaii, Honolulu, HI 96822; [4]Lunar and Planetary Laboratory, Kuiper Space Sciences Building, University of Arizona, Tucson, Arizona 85721

For the first time Clementine UVVIS data has provided us with information on the composition and lateral extent of materials in the Moscoviense basin (147°E, 26°N) on the lunar farside. We have identified several distinct color units in both the mare deposits and highland materials (Figure 1). The most areally extensive and oldest unit in the basin is relatively red. Despite its low albedo, this red material is texturally similar to the surrounding highlands (i.e., rough) and its boundaries do not appear to be controlled by the local topography. These observations are consistent with volcanic pyroclastic materials [1, 2, 3], indicating, perhaps, that a significant portion of the low albedo materials in the Moscoviense basin are underlain by pyroclastics. Based on the superposition relations of the mapped units, this interpretation implies that extensive explosive volcanism occurred prior to mare emplacement. Alternatively, these red materials may represent a melt sheet, but its low albedo makes this interpretation problematic.

Superposed on the putative pyroclastic materials are two distinct mare deposits which are defined by their sharp, lobate boundaries suggestive of effusive volcanism. The oldest of these is spectrally red and occurs both in the western portion the Moscoviense basin and in the floor of Komarov crater. 415/750 nm color ratio measurements (Figure 2) suggest that the TiO_2 abundances in this red mare material is low relative to the standard Mare Serenitatis 2 (MS-2) area (i.e., ~3%). However, errors up to a few percent may still exist in the UVVIS calibration and we are still working on understanding the UVVIS color versus TiO_2 relationship, so the actual abundances may be as high as 5%. Contained within this unit are a group of lunar swirls that have an intermediate albedo, a high mafic content, and appear to be associated with an unnamed fresh crater 10-20 km in diameter and located ~150 km to the north-northwest. This observation adds support to the hypothesis that lunar swirls represent surficial scouring due to cometary comae impacts [4, 5] as these materials are not antipodal to any younger impact basin as would be suggested by [6, 7].

The youngest unit in the basin is a spectrally blue mare unit with an extremely low relative albedo. This material partially embays Titov crater and is also seen filling the floor fractures in Komarov crater. These observations indicate that the mare materials were erupted from the same large magma source. 415/750 nm color ratio measurements (Figure 2) of this unit suggest that the TiO_2 abundances is relatively the same as the standard Mare Serenitatis 2 (MS-2) area (i.e., ~5%). Measurements of partially buried craters identified in Lunar Orbiter images suggest that the total thickness of both of the observed mare units combined is probably less than ~1 km, but this estimate needs to be verified with the Clementine data.

This analysis reveals the unique, complex nature of the geology in Moscoviense basin and, for the first time, provides evidence for large-scale pyroclastic material on the northern lunar farside. Continued mapping of the composition and lateral extent of mare basalts is important for understanding the origin of these deposits, the paucity of volcanic material on the lunar farside relative to the nearside, modeling how the composition of lunar magmas changed through time, and for determining the thermal history of the lunar mantle.

References: [1] Pieters, C., et al., *J. Geophys. Res., 78*, 5867-5875, 1973. [2] Adams, J.B., *et al., Proc. Lunar Planet. Sci. Conf., 5*, 171-186, 1974. [3] Gaddis, L.R., *et al., Icarus, 61*, 461-489, 1985. [4] Schultz, P.H., and L.J. Srnka, *Nature, 287*, 86-87, 1980. [5] Bell, J.F., and B.R. Hawke, *Publ. Astron. Soc. Pac., 99*, 862-867, 1987. [6] Hood, L.L., *Geophys. Res. Lett., 14*, 844-847, 1987. [7] Hood, L.L., and C.R. Williams, *Proc. Lunar Planet. Sci., Conf, 19*, 99-113, 1989.

Figure 1. Geologic sketch map of the Moscoviense area based on Clementine UVVIS data. Large dashed line shows the extent of the basin rim. Lunar swirls are confined to the red mare unit and are represented by anastomosing lines. Fractures in the floor of Komarov are represented by solid lines. Geographic centers of large craters are marked by a dot.

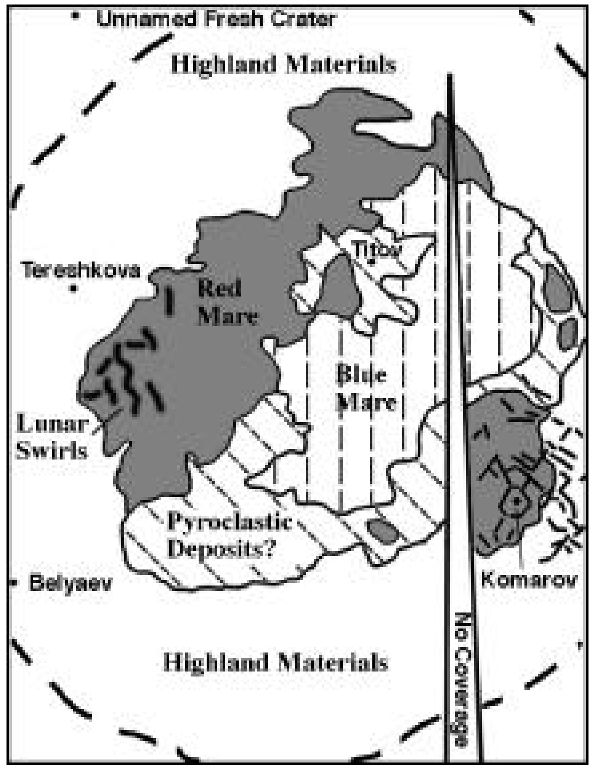

Figure 2. Color ratio plot of identified mare units in the Moscoviense basin. The Mare Serenitatis 2 (MS2) standard area is shown for comparison. These data indicate that the red and blue mare units have a TiO_2 abundance of ~3% and ~5%, respectively.